ABSTRACT

OBJECTIVE: To identify factors that effect battery life of the Medtronic, Minneapolis, MN, is increasingly used for Parkinson's disease almost no empiric human data regarding battery life and the factors which may mitigate it has ever been reported. Given the surgical risks, essential tremor and other movement disorders. The average cost of battery replacement, and the expected increase in DBS usage, battery life is reported as approximately 4-5 years but can vary tremendously. The lithium chloride Soletra® battery under these predictions has been reported. METHODS: We identified all battery replacements done at the Baylor College of Medicine, between 1999 and 2001. Demographic data was collected and the adjustable settings over the entire life of the battery were documented longitudinally. The individual contribution of co-variables on the longevity of IPG devices was assessed by survival analysis based on the Kaplan-Meier method. The log rank test was then used as possible confounders in a Cox regression analysis. RESULTS: We have replaced a total of 122 batteries in 73 patients, 44 male (77.0%, 17 ET, 2 others). The average age at implantation was 61 ± 12.8 years (range: 31-87). Patient demographics of this population were similar to those who have not yet had a battery replacement. The median life of all replaced batteries was 37.4±17.3 months (range: 4-93). Patients with completely expired batteries were replaced sooner at 31.7±14.3 months [range: 4–74]. In this group, the main predictors of a shorter battery life were greater amplitude (p=0.002, C.I.95%: 1.188 - 2.18), 2. greater pulse width (p=0.026, C.I.95%: 1.00 to 1.01. 3. not using exclusively bipolar montages (p=0.029, C.I.95%: 0.29 - 0.94), 3. greater pulse width (p=0.026, C.I.95%: 1.00 to 1.01. 4. a single IPG replacement was performed in 47 patients, two replacements in 14 patients, three replacements in 12 patients, four replacements in 7 patients, and replacements in eight patients in a single group. The overall mean battery survival (N=122) was 37.4±17.3 months. Battery longevity decreases at higher than 3.6 V as a double circuit is maintained constant output until drained down to 3.5 V, we have frequently recorded a battery voltage below 3.64 V, suggesting that the batteries expire before reaching 3.5 V. The individual contribution of co-variables on the longevity of IPG devices was assessed by survival analysis based on the Kaplan-Meier method. The log rank test was then used as possible confounders in a Cox regression analysis. The “end-of-life” status, whether the battery was soon to expire, at time of IPG exchange was a predictor of IPG longevity. The “end-of-life” status, whether the battery was soon to expire, at time of IPG exchange was a predictor of IPG longevity. This study was not actually designed to determine typical battery life, and reflected the relatively higher parameters of this group. The only other published empiric data on battery life reported that 3.4V - 3.5V IPGs had battery failure requiring replacement. (2) The median life span of the batteries was 45 months. Compared to batteries that did not fail, the failed batteries had higher total electrical energy delivered. They did not report single parameter predictors.

DISCUSSION

We empirically found that greater pulse width, greater amplitude, and not using exclusively bipolar montages significantly predicted shorter battery longevity. These are all consistent with published predictions. Our mean battery life was only 31.7 months, but this study was not actually designed to determine typical battery life, and reflected the relatively higher parameters of this group. The only other published empiric data on battery life reported that 3.4V - 3.5V IPGs had battery failure requiring replacement. (2) The median life span of the batteries was 45 months. Compared to batteries that did not fail, the failed batteries had higher total electrical energy delivered. They did not report single parameter predictors.

Future research should determine the proportion of variance that can be predicted from the provided formulas, the role of impedance, compare these results to the Kineta® silver vanadium oxide battery.

REFERENCES


Predictors of Battery Life for the Activa® Soletra 7426 Neurostimulator

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INTRODUCTION

Deep brain stimulation (DBS), most commonly with Activa System®

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